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The landscape of landscape ecologists

The development of landscape ecology has been furthered by the growing volume of complex landscape-related problems facing human societies at a global scale. One such problem is the current rapid transformation of agricultural landscapes. Over the period since World War II, agricultural landscapes have constantly changed due to technological developments and production-oriented agricultural policies in most developed countries that have given rise to a wide variety of landscape ecological problems. These changes have intensified with the current globalization of the market economy, especially as it influences agriculture, due to the breakdown of traditional national support for agricultural production and of import tariffs on agricultural products. There are many different aspects to this transformation, some of which can be clearly elucidated with in a landscape ecological context, by making use of the multidisciplinary tradition developed within modern landscape ecology.

But the complexity of these problems has called for even broader types of scientific cooperation. A growing number of all-embracing interdisciplinary projects, initiated in many countries during the 1990s focus on land use changes, their environmental and landscape consequences, and their linkage to differences and changes in landscape values. A critical task for landscape ecology is to find its place within this new form of scientific cooperation.

The immediate background for this collection of papers is a typical illustration of this development. In 1995, four Danish State Research Councils (Natural Sciences, Social Science, Humanities, and Agricultural and Veterinarian Science) proposed a joint venture to initiate interdisciplinary research projects on the theme *Man, Landscape and Biodiversity*. The initiative resulted in three broad interdisciplinary 5-year projects (1996–2001), cooperating in a common structure on a variety of studies within the theme. Each project involves very different disciplines from different Danish universities and research institutes:

(1) The project *Land Use History and Plant Diversity* investigates the condition of current biodiversity at the genetic, species and ecosystem levels which, to different degrees, has been affected by human use, especially of the forests and dry commons in past, present and future Danish landscapes. The goal is also to give perspectives on the current biodiversity, based on historical developments in floristic diversity and processes in the landscape, as well as providing a theoretical basis for an elaboration of strategies for landscape management, protection, and biodiversity at different scales.

(2) The project *Boundaries in the Landscape* deals with the importance of physical, biological and normative boundaries for biodiversity and landscape structure as related to man's productive and recreational use of nature. Through interdisciplinary cooperation, the aim is to develop new methods to define and diagnose the influence of natural processes and to document these processes, especially those related to the quality of nature and the balance between protection and use of the landscape.

(3) *Value, Landscape and Biodiversity* is a project concerning values, consequences and planning related to integrated management and use of the countryside. Its purpose is to establish an empirical and theoretical framework which, while being able to serve as a foundation for the use and management of the countryside also (a) makes possible an ethical weighting of values and interests, (b) is based on registrations and analysis of relevant biological and economic data and circumstances, and (c) makes use of validated management tools.

The theme, *Man, Landscape and Biodiversity* is only the first in a series of comprehensive public research initiatives on landscape and land use related problems initiated in Denmark over the last few years. These include: *The farmer as landscape manager* (1997–2001), *Changeable landscapes* (1997–2000) and *The agrarian landscape* (1998–2001), each with a budget between 35 and 67 mill. DKK (in all equivalent to app. 26 mill. US$).

To some degree the selection of the three projects could be seen to cover the past, the present and the future of the Danish landscapes. Within the more 'future'-oriented project *Value, Landscape and Biodiversity* an international conference on the theme

'Transformation of Agricultural Landscapes' was organized in Roskilde, Denmark in November 1997. Four sub-themes were established:

(a) Biodiversity in agricultural landscapes.
(b) Heterogeneity in agricultural landscapes.
(c) Urbanization in agricultural landscapes.
(d) Agricultural landscapes: Intrinsic vs. instrumental value. Valuation in management and regulation.

These sub-themes indicate that very different aspects of the transformation process were expected to be explored, but the conference was also purposely set up to evaluate how far a landscape ecological perspective could be useful as an organizing framework for discussion of these themes. This was done by inviting key speakers from very different disciplines to the different sub-themes, with the common denominator being that they had been active in scientific cooperation in landscape ecology at the international level for a number of years.

It has only been possible to include a minority of the papers presented. With the strict rules of reviewing and academic publishing, and with the aim of developing the tradition of interdisciplinary landscape ecology, there is always the danger that some of the more open-minded endeavors to broaden perspectives and to incorporate new and alternative methods of analysis will be lost. On the other hand, some challenging ideas from such a broad interdisciplinary activity are sufficiently robust to survive a critical peer review. You will certainly find such examples in this volume.

The somewhat classical aspect of landscape ecology related to the geo- and bio-ecological consequences of agricultural transformation is discussed in the first group of papers whereas the second group tends more to the fringe of this tradition.

Mander, Kull and Kuusemets present some clear examples of geo-ecological consequences due to the ongoing changes in land use and land cover in Estonian agricultural landscapes during the 1990s. The privatization of agriculture and the constant flow of cheap western subsidized agricultural products have given rise to considerable set-aside of agricultural land and a reduction in agricultural input. The result has been a marked reduction in the discharge of nitrogen, phosphate, sulfur and organic matter. Further, by modeling the relationship between land use and discharge in different scenarios, a powerful tool for predicting the consequences of future land use strategies has been developed, especially in the case of intensive land use scenarios.

Norderhaug, Ihse and Pedersen show how modernization of Norwegian agriculture has threatened some of the most rich and diverse types of habitat in Norway, namely the traditional hay fields. These have been afforestated or changed and, in addition, have been increasingly threatened through the loss of the traditional mode of production and increasing fragmentation. Support of modern grazing may keep the landscape open but does not solve the biodiversity problem. The only way to secure the high and unique biodiversity of these culturally developed habitats is to support traditional management, and to ensure the appropriate management of the surrounding matrix.

Transforming agricultural landscapes toward a multiple land use state also means a deliberate change and improvement to forest edges and hedges. *Herlin and Fry* elucidate the landscape ecological consequences of land use change in agricultural landscapes for botanical diversification in wooded corridors and forest edges, showing how woody species distribution and landscape structure are linked in a positive feedback loop. In the transformation process, a careful directing of natural colonization by woody species in hedgerows and forest edges can be a cost-effective measure in landscape management, as well as an inspiration and guide for an edge planting strategy.

Wagner, Wildi and Ewald explore the problems of measuring biological diversity in agricultural landscapes. In the agricultural mosaic, diversity seems related to habitat variability, habitat heterogeneity and general land use intensity rather than to patch size since edge, not interior species, dominate. Through a partitioning of landscape species diversity into additive components, the contributions of habitat variability, habitat heterogeneity and patch-specific diversity to landscape diversity have been quantified. This quantification has been clone to allow for a comparison of diversity within and between landscape elements at various scales. Considerable variations for different measures of diversity are found. The authors recommend using several scale levels simultaneously comparing the diversity of different habitats.

Langevelde et al. formalize a basic interdisciplinary problem in land use planning through a model for planning an ecological network in an intensively used agricultural landscape that optimizes ecological benefits with minimal disadvantages to the agricultural system. In principle, this model could be developed as a model for evaluation of proposals for the multiple use of transformed agricultural landscapes.

Antrop goes beyond one of the main forces behind this emerging multiple land use: namely, the ongoing comprehensive urbanization of agricultural areas. This gives rise to many landscape ecological problems that have seldom, and only with great difficulty, been studied within landscape ecology. Very different scientific and planning traditions in urban studies have to be confronted here. Due to the rapid and complicated changes in land cover and land use related to the urbanization of agricultural landscapes, the data necessary for these landscape ecological studies are seldom available. The methods for post evaluation and monitoring of legal procedures for environmental impact assessment related to planned actions are generally not available. A further constraint is that the more 'disturbed' urban-influenced landscapes are not traditionally a focus for a majority of landscape ecologists. Consequently, the theoretical and methodological strength of urban ecology as well as a change in attitude amongst 'landscape ecologists' are both necessary to meet the challenge of the ongoing landscape ecological changes due to urbanization in agricultural areas.

The development of tools for the evaluation of policy influencing nature and landscape is precisely the focus of the contribution of *Oñate*, *Andersen*, *Peco* and *Primdahl*. The emerging incorporation of environmental and landscape considerations in national as well as supranational agricultural policy, e.g. in the E.U., makes it more and more necessary to develop reliable measurements, not only of the state and value of different agro-environmental systems, but also of direct policy impact. The authors emphasize an important distinction between policy performance (effect on farming practices) and policy outcomes (effect at the landscape level). For evaluation of policy performance it is particularly necessary to have data at the farm level. Here they present useful distinctions between indicators related to land use issues and to management practices, and furthermore between improvement and protection effects. The usefulness of the method is documented in a comparison of the effects of the EC agri-environmental regulation 2078/92 in two very different agricultural landscapes in Spain and Denmark.

O'Neill addresses social conflicts concerning the future of our landscapes as public environments. Referring to a contingent valuation study of the Yorkshire Dales in the Pennine Range, England, he criticizes the use of cost-benefit analysis in landscape evaluation, since landscape conflicts involve issues of identity and conflicts of perceived rights that cannot be taken into account by such methods. This critique is supported by interviews with local residents in the area who have a much more community-based view of their landscape than that captured by the pictorial-based contingent valuation which is methodologically oriented towards the many visitors coming for recreation in the Dales.

Finally, *Arler* generalizes such problems and other questions on landscape quality in a way highly relevant to landscape ecologists, not only as scientists, but also in their work as landscape planners and managers. Based on the observation that environmental and landscape policy has developed from a protective to a constructive character, and in trying to enhance the qualitative aspects of our landscapes as a component of the good life, he argues for an acknowledgement of a landscape evaluation based on what he calls the *connoisseurs*. These are persons who know the qualities in a certain area well, who are capable of identifying them, and, at least to a certain extent, of weighing them against each other on a scale of importance. This scale is not constant, but changes within different groups along with their growing knowledge and experience. Further, he rejects the opinion that landscape quality is related especially to subjective affections and projections, and elucidates his standpoint through a critical discussion of the attractiveness of biodiversity, overall landscape character or 'atmosphere', and pictoral qualities of a landscape as scenery. However, he also modifies these qualities through an enhancement of the fundamental importance of their historical and narrative values. He concludes that the key to a better regard for landscape quality is a democratic dialogue and deliberation with due respect for different kinds of connoisseurs that include more than just surveys and calculations of everybody's accidental 'here and now' preferences. In other words, he emphasizes the importance of landscape ecologists as 'connoisseurs' at the same time warning against them as propagandists for a 'scientific management' based on operational concepts around an optimal spatial configuration of ecosystems and land uses.

Thus, moving from the well established tradition within a primarily nature/science oriented landscape ecology toward a more broad and practice oriented approach, dealing with landscape studies as guidance for an enhancement of the qualitative aspects of our landscapes as a component of the good life, we are confronted with a variety of challenges from the transformation of agricultural landscapes, all central to the understanding of changes in our landscapes. Are all

these challenges equally relevant for the development of landscape ecology? Can landscape ecology be defined and developed solely from public demands for concrete landscape based information, e.g. concerning the transformation of agricultural landscapes? Or do we need to develop more like a classical discipline with a well-defined object of study and related theories and methods?

This special issue of *Landscape Ecology* is a good opportunity to discuss such questions. In an introductory paper, *Moss* raises a basic question for landscape ecologists involving themselves in practical interdisciplinary contributions to environmental problem-solving. Can the emerging field of landscape ecology harness and integrate the results from the diversity of distinct approaches and studies involved in such interdisciplinary teams? He has an apparently simple answer: Yes, but only if landscape ecology develops more like a discipline, focussing on the landscape as a distinct entity, to provide answers to sets of questions being raised about the landscapes themselves. Emphasizing the very different development of landscape ecology in USA, Canada and Eastern Europe, he shows how landscape ecology has developed both from different types of cooperation among academic disciplines and from the goal-oriented practical needs of different sectors in the societal/government structure. He calls attention to the fact that landscape ecological cooperation among disciplines has developed, in practice, into several distinct unidirectional interdisciplinarities, which do not converge, since the land(scape) is rarely the primary focus of those disciplines imposing the coordination of this interdisciplinarity. And he stresses that the overarching goal-oriented transdisciplinarity developed to solve particular problems is threatened because of the unstable character of the interdisciplinary teams. Focussing more on questions raised about the landscape itself rather than about impact from peripheral, yet still related factors will not only strengthen landscape ecology as an emerging discipline, it will also clarify its objectives so that landscape ecology can be recognized as having a distinctive role to play in environmental problem solving.

However, to focus on the landscape itself is not that easy either, because a variety of different landscape concepts exist and even co-exist. In particular, they differ among the disciplines and traditions within landscape ecology. In any discussion of perspectives and viewpoints on what landscape ecology is, Moss advocates that participants outline their personal background and experience. A number of landscape ecologists, active in IALE, have published such 'personal testimony' in the *IALE Bulletin* in 1998 and 1999 (Decamps[1], Merriam[2], Duning[3], Naveh[4], Zonneveld[5] and Ružicka[6]). Moss has a background in physical geography and plant ecology. Without doubt it has contributed to the development of *his* distinct concept of landscape which follows a classical tradition within geo-ecology. This is to him *the* landscape '*sensu strictu*'. However, there are many landscape concepts, and one could argue that each of the 'several distinct unidirectional interdisciplinarities within landscape ecology' has its own landscape concept. So, a central question is: Can we find a common denominator for these different landscape concepts, e.g. for the geo-ecological landscape concept, forwarded by Moss, and the 'landscape as a component of the good life' discussed by Arler? Very often the answer to such a question will be: This is not possible; the question belongs to two different realms that you cannot compare. For landscape ecologists, this should not be an acceptable answer. We know the concepts are linked together. In 1945, W.I. Vernadski[7] presented the concept of the noosphere, the emerging historical phase of the earth, where man developed as the dominating geological force, the main landscape forming factor, just as life had developed as a new and important geological force forming the face of the earth from the late Precambrian. For this famous Russian geochemist, the core of the noosphere concept was not to express the cultural landscapes of our future world as a result of the human *mind* – as opposed to 'nature' but to stress much more the special dynamics related to it, and to see it as the evolving dominating material expression of human *nature*. To him, the noosphere was, in fact, an optimistic expression of the vision of the future global 'landscape as a component of the good life'.

[1]H. Decamps (1998): Which way did you enter landscape ecology? IALE Bulletin, Vol. 16, 2.

[2]G. Merriam (1998) The IALE Mission Statement in my perspective. IALE Bulletin, Vol. 16, 3.

[3]X. Duning (1998): The IALE Mission statement and Chinese landscape ecology. IALE Bulletin, Vol. 16, 4.

[4]Z. Naveh (1998): My road to a holistic mission-driven transdisciplinary landscape ecology. IALE Bulletin, Vol. 16, 5.

[5]I. Zonneveld (1998): How I became a landscape ecologist. IALE Bulletin, Vol. 16, 6.

[6]M. Ružicka (1999): My role and the contribution of Slovak landscape ecology to the development of IALE. IALE Bulletin, Vol. 17, 2.

[7]W. I. Vernadsky (1945): The biosphere and the noösphere. American Scientist, Vol. 33, 1.

However, this remains a very material and concrete vision!

Still, however, our landscape concepts and our analytical tools related to them are very different and in general very simple, reflecting the historical specializations with science. There are fundamental differences between the geo-ecological and the spatial ecological concepts of landscapes, and there is a world of difference between these and the concepts of landscape to be found in the humanities and the social sciences, which see landscapes primarily as mental constructs, only to be understood and handled in a social and historical context. So, focusing on the landscape itself will initially unveil our different concepts of the landscape, but hopefully it will further a convergence that will be necessary to fulfill our aim *to develop landscape ecology as the scientific basis for the analysis, planning and management of the landscapes of the world*[8].

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[8]IALE Executive Committee (1998): IALE Mission Statement. IALE Bulletin, Vol. 16, 1.